Coastal Engineering Technical Note

EROSION CONTROL AND HABITAT DEVELOPMENT WITH SMOOTH CORDGRASS ON THE GULF AND ATLANTIC COASTS

INTRODUCTION: In recent years there has been increased interest in the establishment or rehabilitation of coastal salt marshes. Plantings are generally made for the purpose of shore protection, dredged material stabilization or habitat development. On the Gulf and Atlantic coasts the dominant, emergent plant of the regularly flooded portion of the intertidal zone is smooth cordgrass (*Spartina alterniflora*) (Fig. 1). Much attention has been focused upon the planting of this species. In general, this plant can be grown successfully in a wide variety of intertidal environments. The principle obstacle to the establishment of smooth cordgrass is wave stress. In intertidal environments that are sheltered from waves, invasion and establishment will occur naturally in two to three years without planting if the site is adjacent to existing marshes. In areas subject to wave stress, however, invasion may be slow and protracted or may not occur at all even when natural marshes are nearby.

OBJECTIVE: This technical note provides a method for determining wave climate severity and the probability of planting success at specific sites. In addition, planting specifications for smooth cordgrass are presented.

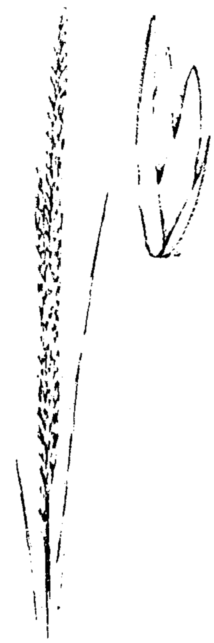

Figure 1. Smooth Cordgrass

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Report Documentation Page	*Form Approved* *OMB No. 0704-0188*

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1. REPORT DATE **NOV 1981**	2. REPORT TYPE	3. DATES COVERED **00-00-1981 to 00-00-1981**

4. TITLE AND SUBTITLE **Erosion Control and Habitat Development with Smooth Cordgrass on the GUlf and Atlantic Coasts**	5a. CONTRACT NUMBER 5b. GRANT NUMBER 5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER 5e. TASK NUMBER 5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **U.S. Army Corps of Engineers (USACE),Coastal and Hydraulics Laboratory,3909 Halls Ferry Road,Vicksburg,MS,39180**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR’S ACRONYM(S) 11. SPONSOR/MONITOR’S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**5**	

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18

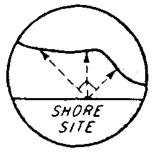
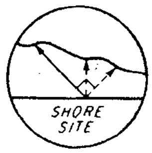
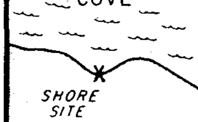
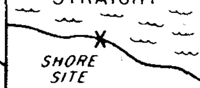
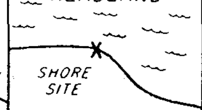
WAVE CLIMATE VS. PROBABILITY OF SUCCESS: No single parameter or list of parameters can accurately predict that a planting will or will not be successful. It is rather, a question of probabilities. Under the best conditions the success of a planting will be influenced by factors such as (1) the care taken by the planter, (2) the occurrence of severe storms or drought, (3) the impact of foot and vehicular traffic, and (4) wildlife predation. However, Knutson, et al. (1981), found that the shore characteristics of FETCH, SHORE GEOMETRY and SEDIMENT GRAIN SIZE were useful indicators of wave climate severity and the likelihood of planting success. Figure 2 is a Vegetative Stabilization Site Evaluation Form based upon the above shore characteristics. This form may be used to evaluate potential marsh planting areas. It allows the user to estimate the success rate of other plantings made under similar conditions. The user (1) measures each *Shore characteristic* for the area in question, (2) identifies the *descriptive categories* which best describe the area, (3) notes the *weighted score* associated with each *descriptive category*, (4) calculates a *cumulative score* and (5) compares the *cumulative score* to the *potential success rate*.

This type of evaluation is important to the decision process for selecting planting sites. For example, in a mitigation or habitat development project a potential success rate of 50 percent might cause concern and an alternative site may be sought which has more favorable planting conditions. For vegetative stabilization projects, however, 50 percent potential success rate may be very promising considering that structural alternatives may be 10 times more costly.

PLANTING SPECIFICATIONS - SMOOTH CORDGRASS:

Planting Zone: Mean low water to mean high water where tidal range is less than 6 feet (2 meters); mean tide to mean high water where tidal range is greater than 6 feet.

Planting Width: The entire planting zone should be planted whenever practicable. However, there is typically no advantage in planting to a width of more than 65 feet (20 meters). A practical minimum width is 20 feet (6.0 meters) or 60 percent of the planting zone, whichever is greater, When only a portion of the intertidal zone is to be planted, planting should be from mean high water seaward.

1. SHORE CHARACTERISTICS	2. DESCRIPTIVE CATEGORIES (SCORE WEIGHTED BY PERCENT SUCCESSFUL)				3. WEIGHTED SCORE
a. FETCH-AVERAGE AVERAGE DISTANCE IN KILOMETERS (MILES) OF OPEN WATER MEASURED PERPENDICULAR TO THE SHORE AND 45° EITHER SIDE OF PERPENDICULAR 	LESS THAN 1.0 (0.6)	1.1 (0.7) to 3.0 (1.9)	3.1 (1.9) to 9.0 (5.6)	GREATER THAN 9.0 (5.6)	
	(87)	(66)	(44)	(37)	
b. FETCH-LONGEST LONGEST DISTANCE IN KILOMETERS (MILES) OF OPEN WATER MEASURED PERPENDICULAR TO THE SHORE OR 45° EITHER SIDE OF PERPENDICULAR 	LESS THAN 2.0 (1.2)	2.1 (1.3) to 6.0 (3.7)	6.1 (3.8) to 18.0 (11.2)	GREATER THAN 18.0 (11.2)	
	(89)	(67)	(41)	(17)	
c. SHORELINE GEOMETRY GENERAL SHAPE OF THE SHORELINE AT THE POINT OF INTEREST PLUS 200 METERS (660 FT) ON EITHER SIDE	COVE 	MEANDER OR STRAIGHT 	HEADLAND 		
	(85)	(62)	(50)		
d. SEDIMENT GRAIN SIZE OF SEDIMENTS IN SWASH ZONE (mm)	less than 0.4	0.4 – 0.8	greater than 0.8		
	(84)	(41)	(18)		
4. CUMULATIVE SCORE					

5. SCORE INTERPRETATION			
a. CUMULATIVE SCORE	122 – 200	201 – 300	300 – 345
b. POTENTIAL SUCCESS RATE	0 to 30%	30 to 80%	80 to 100%

Figure 2. Vegetative Stabilization Site Evaluation Form

Plant Spacing: Two or three sprigs per hole or one potted seedling, twenty inch (0.5 meter) spacing between holes.

Salinity: 5 to 34 parts per thousand.

Light: Site must be devoid of an overstory of woody vegetation.

Sediment: Sediment grain size is an indicator of wave severity (see Fig. 2); however, in the absence of wave stress, sediments ranging from clay to coarse sand provide no barrier to plant establishment.

Plant Materials: Sprigs (stems with attached root material) and potted seedlings are suitable.

Planting Techniques: Hand planting or mechanical planting (tobacco planter or strawberry planter) equally suitable.

Planting Season: Spring (March, April, and May); early spring in southern regions and late spring in northern regions.

Fertilization: Fertilization is recommended for all plantings subject to wave stress except where previous experience has shown it to be unneeded. Two general types of fertilizer can be used, soluble or slow release. Soluble materials should be either broadcast and disked in prior to planting, spread in the planting furrow, placed in a second hole beside the planting hole, or placed in the bottom of the planting hole and covered with soil before the plant is inserted. Slow release materials such as Osmocote or Mag Amp should be applied in the planting hole or furrow.

If soluble materials are used, they should be applied at a rate of 90 pounds per acre (100 kilograms per hectare) of nitrogen at the time of planting. In conventional mixed fertilizers, such as 10-10-10, the number designations represent the percentages (by weight) of nitrogen, phosphorous and potassium, respectively, that are found in the mixture. Therefore, the amount of 10-10-10 fertilizer per acre needed to provide 90 pounds of nitrogen would be 900 pounds per acre (1000 kilograms per hectare). A top-dressing of an additional 90 pounds per acre of soluble nitrogen, 6 to 8 weeks after planting, will be helpful on deficient sites and a third 90-pound application 6 weeks later will be advisable on acutely deficient sites.

Slow release materials, if used in lieu of soluble fertilizer, should be applied at a rate of 90 pounds per acre of nitrogen at time of planting. Slow release materials should always be placed in the planting hole or furrow. For conventional slow release mixtures (14-14-14 or 16-8-12), about ½ ounce (15 grams) of fertilizer should be placed in each hole. When slow release materials are used, no additional applications are necessary during the first growing season.

If plant cover and development are not adequate by the second growing season, fertilize again with 90 pounds per acre of nitrogen using a soluble source broadcast at low tide in early spring. After establishment, the color of the

grass itself can be used as a general indicator of available nitrogen. Dark leaves indicate an adequate supply while lighter shades of green and yellowing lower leaves during active growth results from too little nitrogen.

Planting Maintenance: Debris such as wood, styrofoam, algae, and dislodged submerged plants may accumulate in the planting areas and form a strand line. This material will smother and damage plantings particularly during the first two growing seasons. This debris should be removed in both the fall and spring.

Canada and Snow geese are fond of the tender roots of marsh plants. In areas of high winter wildfowl concentrations they may damage or destroy a planted area before the plants are well established. Open fences erected on the seaward edge of planted areas have been used successfully to exclude waterfowl during the first few growing seasons.

Number of Planting Units: The number of planting units required depends upon the spacing between holes and the number of planting units per hole.

$$\text{Number of Planting Units} = \frac{\text{Area of Planting}}{(\text{Spacing})^2} \times \begin{array}{l}\text{Number of Planting Units} \\ \text{per Hole (2-3 sprigs or} \\ \text{1 potted seedling)}\end{array}$$

Labor Estimate: Sprigs require about 1 manhour per 100 holes and potted seedlings about 2 to 3 manhours per 100 holes.

ADDITIONAL INFORMATION: For further information contact the U.S. Coastal Engineering Research Center, Coastal Ecology Branch (202) 325-7393.

REFERENCES:

KNUTSON, P.L., et al., "National Survey of Planted Salt Marshes (Vegetative Stabilization and Wave Stress) Wetlands," *The Journal of the Society of Wetland Scientists*, 1981.

WOODHOUSE, W.W., Jr., "Building Salt Marshes along the Coasts of the Continental United States," SR No. 4, U.S. Army, Corps of Engineers, Coastal Engineering Research Center, Fort Belvoir, VA., 1979.